

3) Amendment to the Detailed Description:

DETAILED DESCRIPTION

In ~~[[Fig. 1]]~~ Fig. 2, the normal thermal cycle of the invention consists of a ~~[[wet]]~~ wet compression, indicated with 1-2, regenerative heating indicated with 2-3, continuous combustion heating indicated with 3-4, dry expansions indicated with 4-5, reheating for continuous combustion heating indicated with 5-6, dry expansion indicated with 6-7, regenerative catalytic heating indicated with 7-8, regenerative cooling indicated with 8-9, cooling for condensation of water vapor indicated with 9-10, and with outlet exhaust gases to state 1.

In ~~[[Fig. 2]]~~ Fig. 1, indicated with 1 is the dry air filter, indicated with 2, is the oil-free air ~~[[screw]]~~ compressor ~~[[oil-free of with external synchronized timing gear]]~~, this compressor consists essentially of two helical grooved no contact rotors, a male, the driver, four lobes, and one female, six ~~[[gouilles]]~~, gullies in a stationary housing with suitable inlet and outlet ports, with water ~~[[injection]]~~ injector and combined sliding valve for capacity modulation from 10 % to 100 % and pressure ratio modulation from 4 to 20, indicated with 3 is the high pressure water separator; in ~~[[Fig. 2]]~~ Fig. 1 indicated with 4 the high pressure side of the regenerator, is a heat exchanger that heats the air compressed before combustion with heat rejected by the cycle; indicated with 5, is the first combustor in which the fuel is burned with primary air and the hot gas is diluted with secondary air for a homogeneous mixture of the outlet gas at constant temperature of 2,500 °F, indicated with 6 is the first stage expander, it is a gyratory

screws machine ~~[[with rotors fully synchronized and]]~~ without contact between screws or housing and screws, this expander drives only the ~~[[compressor]]~~ compressor and the ~~[[accessories]]~~ accessories, the hot gas escaping in the first expander is recuperated by the second expander, the outlet gas from the first expander indicated with 6, that goes to the second combustor indicated with 7 or to the catalyzer indicated with 9, by means of a damper indicated with 19, in principle the part at high temperature use a stainless steel alloy of ~~[[iron-cobalt-nique]]~~ iron-cobalt-nickel with coating of alloy of chromium-aluminium-ytrio, the internal cooling is by water at head pressure for bearing and gears box, and by water vaporization in rotors and housing; the second combustor indicated with 7 has steam injection generated by the internal cooling, for inlet run the fuel injection ~~[[injection]]~~ is cut, the pressure ratio is reduced at minimum, and the damper indicated with 19 is closed, in normal run the outlet gas of the second combustor indicated with 7 is of constant temperature, 2,500 °F; indicated with 8 is the second stage expander which drives the outpower shaft, the escaping of hot gas in second expander is recupered by the regenerator; indicated with 9 is a typical catalytic converter for regenerative combustion turbine; indicated with 10 is the low pressure side regenerator; indicated with 11 is an air cooled condenser that ~~[[recuperated]]~~ recuperates water from water injector ~~[[injected]]~~ and generated by combustion, indicated with 12 is the low pressure water separator; indicated with 13 is the water tank insulated with automatic heater for low temperatures, water filter for the solid removal and to

~~[[neutralized]]~~ neutralize oxides and acid of sulphur; indicated with 14 is the water pump for the compressor indicated with 2; indicated with 15 is the air cooled for the water compressor indicated with 2; ~~indicated~~ with 16 is the water ~~[[injected]]~~ injector with the water outlet from cooling of gears, seals, anti-friction ball and roller bearings of compressor indicated with 2; indicated with 17 is the water and air outlet from compressor indicated with 2 to separator indicated with 3; indicated with 18 is the water control for cooling of expander indicated with 6 and the expander indicated with 8; indicated with 19 is the damper valve for idle run; indicated with 20 is a steam separator; indicated with 21 is a water ejector for exhaust gas aspiration from the low pressure side of the regenerator indicated with 10.-

4) Amendments to the Claim

What I claim as my invention is:

-1) An internal combustion engine of open closed cycle and binary fluid comprising:

a dry air filter for cleaning ~~[[the dust of the]]~~ aspired atmospheric air;

a water ~~[[injection]]~~ injector twin screw compressor that compresses air and pumps water, oil-free, in a single stage, with air flow from 10 percent up to 100 percent, air pressure ratio from 4:1 up to 20:1 ~~[[and water mass injected from 0 up to 200 percent of aspired air mass]]~~;

a high-pressure water separator ~~[[of high pressure]]~~ to remove the water at high pressure ~~[[of]]~~ from the compressed air;

a ~~[[static]]~~ high-pressure side regenerator ~~[[, high pressure side]]~~ for recuperative heating of the compressed air;

a first combustor to burn different types of liquid or gaseous fuels for heating the preheated compressed air in a continuous combustion;

a first ~~[[dry]]~~ twin screw expander with fixed expansion ratio for a first expansion stage of hot gasses from the first combustor at constant maximum peak temperature, ~~[[this]]~~ the first twin screw expander drives the compressor;

a damper ~~[[control]]~~, for ~~[[the regulation of]]~~ regulating the amount of hot gasses ~~[[allowed]]~~ being delivered into the second combustion chamber, and bypassing the hot gasses to a regenerative catalytic reactor;

a second combustor burning different types of liquid or gaseous

fuels for reheating the hot gasses and steam injected in a continuous combustion, the fuel injected in the second combustor and the steam injected are cut off simultaneously in idle run;

a second ~~[[dry]]~~ twin screw expander with fixed expansion ratio for a second expansion stage of hot gasses and steam from the second combustor at constant maximum peak temperature, the second twin screw expander has an output power shaft;

a regenerative catalytic converter and thermal reactor recovers heat increasing the temperature of exhaust gasses by means of the post combustion of hydrocarbon and carbon monoxide and reducing the nitrogen oxides;

a low-pressure regenerator, ~~[[,low side, where]]~~ wherein the hot exhaust gasses is cooled and the water vapor is condensed;

a steam separator~~[[, is a large insulated pressure vessel, partially filled with hot water, when steam supply exceeds demand, the high-pressure steam is injected into the steam separator, the steam condensed gives up its latent heat, to raise the pressure, temperature, and heat content of the water body, when the steam demand exceeds the supply, the pressure in the accumulator drops and the additional required steam flashes from the water, taking back the heat previously stored; when the supply is superheated steam the accumulator is dried and if the supply exceeds demand, the steam is injected in the medium exchanger of the regenerator, the steam is cooled and the heat is recovered;]]~~ wherein the high-pressure steam coming out of the first and second twin screw expanders is injected;

~~[[an]]~~ a water ejector combining a high-pressure fluid with a low-pressure fluid to form an intermediate-pressure fluid supply;

a condenser, ~~[[cooled by natural or forced circulation of atmospheric air through it to]]~~ recovering water from the exhaust gasses and steam;

a low-pressure water separator, wherein the injected water and the water are generated by combustion is removed from the exhaust gasses, ~~[[them]]~~ and then the exhaust gasses are discharged right to the atmosphere;

an insulated water tank having a filter for the solid removal and to neutralize oxides, acid and sulfur dioxide;

a water pump transfer water from the insulate water tank to ~~[[the]]~~ ~~[[water]]~~ a cooler, the water being supplied through a water injector to cool down the water-injection twin compressor;

~~[[a water cooler, cooled by natural or forced circulation of atmospheric air;]]~~

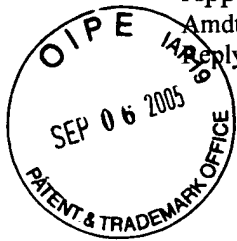
~~[[a water injection in the compressor for internal cooling;]]~~

~~[[a water flow control of internal cooling in the two expanders for steam generation;]]~~

a water flow control water flow from the high-pressure water separator being supplied to the first twin-screw expander and the second twin-screw expander;

a steam injector in the damper ~~[[control of]]~~ controlling hot gasses to be delivered to the ~~[[for]]~~ second twin-screw expander.--

Lelio Dante Greppi



[[Fig. 2-]] 1

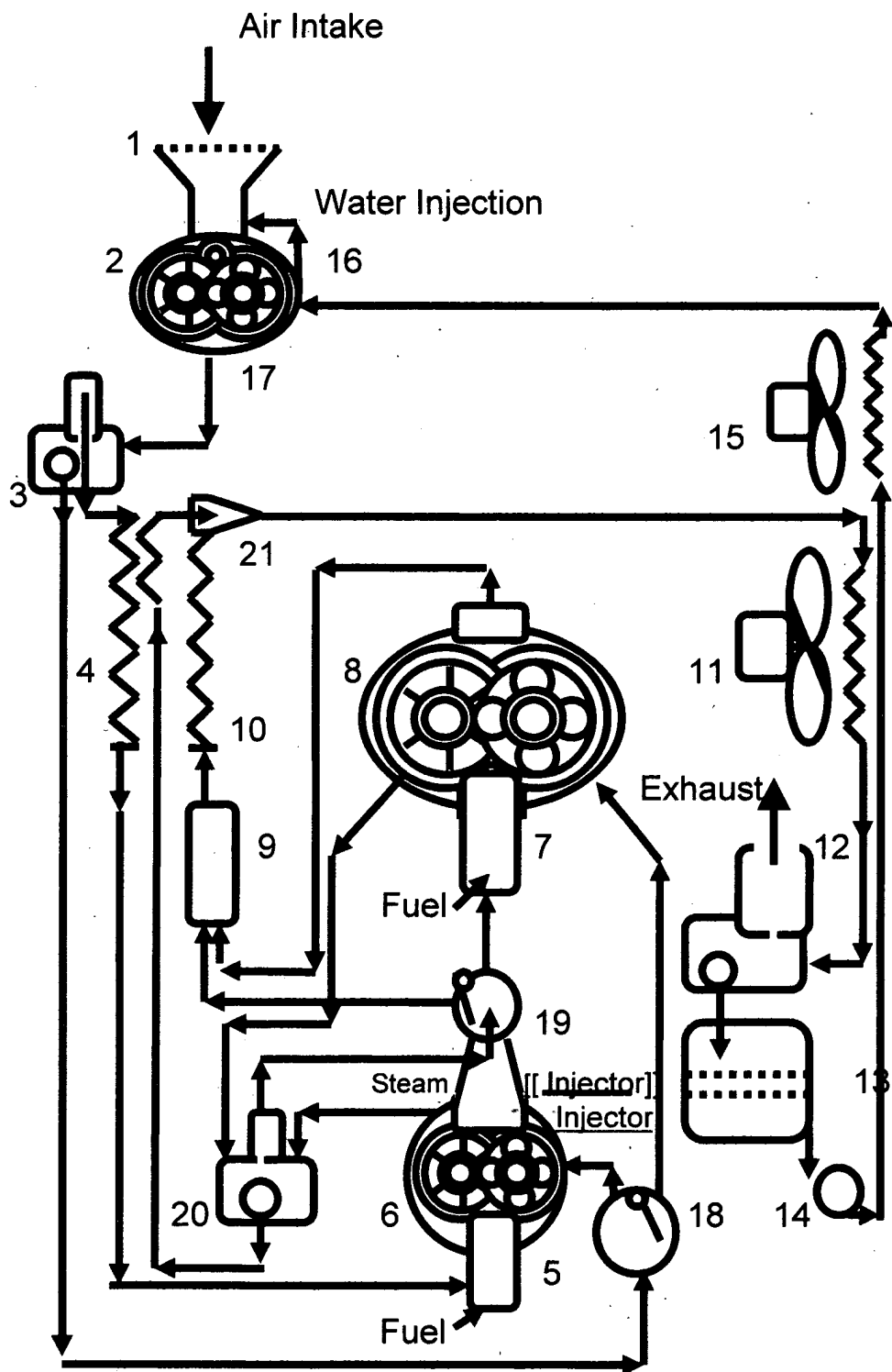


Fig. 1

